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Generalized Method Moment Logistic Regression Model on the Prevalence of Acute Respiratory Tract Infections

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ABSTRACT

Acute Respiratory Tract Infections (RTI) is a disease that most votes suffered by children both in developed and in progress and have been able to and many of them need to go to the hospital because of the disease just emergency. Acute (RTI) is still an important health problem because the cause of the death of infants and children under five are quite high which is about 1 out of 4 death that happens. The purpose of this research examines the factors that affect the genesis acute (RTI) using logistic regression approach with estimates of the maximum likelihood estimator (MLE) and generalized method moment (GMM). This research done in the Clinic in Banjarmasin. The results of the study showed that the estimates of the GMM method on logistic regression model gives better performance in terms of the significance and interpretation than MLE method. The prevalence of acute (RTI) on children 6-12 months more often occurs in children who are not given breast milk, on children with low birth weight (LBW) (< 2500 grams), on children who get MPASI at age $\leq$ 6 months, on children in families with low economic social status, on children with passive smoker status, on children with the status of immunization is not complete. Children who are given non breast milk experience acute (RTI) higher compared with breast feeding by exclusion. The number of infants more than 2 in the house of the level of education of mother and shelter house, not related to the Genesis acute (RTI). Research is expected to use based on the other pembobot, like Bartlett kernel, Parzen kernel, Truncated kernel, and Tukey-Hanning kernel that is made possible by the GMM estimation provides better results.
KEYWORDS: GMM, Logsitik Regression, acute, Patterns Breast Feeding

INTRODUCTION

Acute (RTI) is a disease of the respiratory tract with special attention on the lung inflammation (Phenomonia), and not the disease ear and throat. Acute (RTI) is acute respiratory tract, this term covers three basic namely, respiratory tract infections and acute. The infection is the entry of germs or microorganisms into the human body and multiply so that cause symptoms of disease. The respiratory tract is an organ of such as the nose until the alveoli and adneksnya organs such as the sinus sinus middle ear cavity and pleora. Acute (RTI) are anatomically include infection of the respiratory tract infection [1]. Each child is expected to experience 3-6 episodes acute (RTI) every year, 40 % -60 % from the visit in the clinic is by disease acute (RTI) [2].

Acute (RTI) more occurs in developing countries compared to developed countries with the percentage of each by 25%-30% and 10%-15%. The death of infants due to acute (RTI) in Southeast Asia as much as 2.1 million infants in 2004. India, Bangladesh, Indonesia and Myanmar is a country with the case of the death of infants due to acute (RTI) majority votes [3]. Based on the technical office data Kalsel, respiratory disease which is still a threat to the local community is acute (RTI). Each year the number of patients with acute (RTI) in Kalsel shows a significant increase. The year 2010 is found 100 thousands of people affected by the disease acute (RTI) "Disease acute (RTI) is indeed still a threat to the community in South Kalimantan. The year 2010 is no more than 100 thousand cases occurred in South Kalimantan. The head of the health of South Kalimantan for the case of acute (RTI) dyspnea, data Public Health Service Kalsel until October 2010 find as much as 963 cases spread in 13 districts. Then to acute (RTI) not breathing difficulty there are 119.350 cases, also spread in 13 regencies/cities. According to the data from the District health office Tanah Bumbu years 2014 on the moon January-december acquired infants who could anticipate acute (RTI) many 27.457 [4].

The research that related with acute (RTI), [5], which means there is a correlation between the level of zinc hair with genesis acute (RTI), and there is a correlation that means between the level of zinc with genesis diarrhea in infants stunting of entities exist and infants under normal. On the condition of the zinc that low in the body more vulnerable to the bacteria that produce the toxin. According to [6], factors risk for acute (RTI) in infant age 0-4 months is birth weight (BBL), nutritional status, breast feeding, education mother, density shelter, state of ventilation smoke burning, smoke and the layout of the kitchen. Acute (RTI) is a disease that most votes suffered by children both in developed and in progress and have been able to and many of them need to go to the hospital because of the disease just emergency [3]. Diseases of the respiratory tract on the infants and children can also give defect until on adulthood where found there is a relationship with the chronic obstructive

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pulmonary disease. Acute (RTI) is still an important health problem because the cause of the death of infants and children under five are quite high which is about 1 out of 4 death [7]. Until this time the mortality acute (RTI) that weight is still very high. Death is often caused because the patients come for treatment in severe condition and often accompanied by the complications of the complications and less nutrition [8]

Then with GMM method, [9], apply GMM estimation of simultaneous equation for dynamic panel in the modeling of economic growth in Indonesia. The development of economic growth is one of the indicators in the maintenance efforts of health, in addition to the awareness of the subject of the economic actors and the business. According [10], which apply GMM estimation to know the relationship of economic growth against the potential for the spread of the virus HIV/AIDS in Australia. Then [11], are modeling Capital Assets Pricing System (CPAM Model) with risk analysis on 8 mining companies in Indonesia with GMM estimation method.

Bad breast feeding in Indonesia, limited food supplies in the household levels and limited access infants sick toward quality health services cause 5 million children suffered malnourished [12]. Especially in view of the still high number of acute (RTI) in Indonesia, risk factors that can cause the genesis acute (RTI) is internal and external factor. The internal factors consist of the age of approximately 2 months, LBW, male, nutrient status, deficiency of vitamin A, blanketed excessive force children, providing additional food too early while factor outward signs are exclusive breastfeeding, immunization, air pollution (norm smoker family members normally housed infants live), density shelter, fentilasi less sufficient and social economy [13]. Based on that, this research examines the factors that affect the genesis acute (RTI) based on risk factor in the Clinic in Banjarmasin using logistic regression with GMM approach [14][15][16].

METHODOLOGY

The type of the instrument that is done is the type of research analytically cohort studies [17]. The building blocks of this research is to cross-sectional. The sample in this research is the mother who has children aged 6-12 months dwelling place in the clinic in Banjarmasin, where the subject of this research must meet the criteria of inclusion and eklusi method with *simple random sampling*.

The framework of the concept of the genesis acute (RTI) finances on the following image.

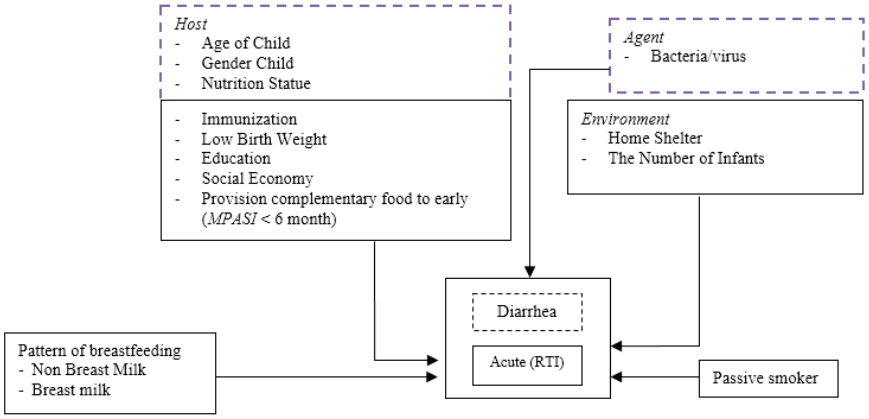

Figure 1. Conceptual Framework Application research Theory L, Green [14][18]

Based on the framework of the concept in the picture 1, then the method used is logistic regression with GMM approach. Logistic regression is one of the methods that can be used to search for the relationship between the response variable (Y) a dichotomous (nominal scale) and is polichotomous (nominal scale or ordinal with more than two categories) with one or more variables predictors are continuously or categories [19]. Outcome of the response variable consists of 2 categories namely Y=1(success) and Y=0 (failed). Y follow Bernoulli distribution with the value of hope, E(Y) = p and Var(Y)=p(1-p) for each observation. Logistic regression model describes the probability or risk from an object, served as follows [20]:

$$\pi(x) = \frac{e^{(\beta_0+\beta_1 x_1+...+\beta_k x_k)}}{1+e^{(\beta_0+\beta_1 x_1+...+\beta_k x_k)}}$$

In the regression model linier, it is assumed that the observations of the response variable expressed as $y = E(Y|x) + \varepsilon$, With $E(Y|\underset{\sim}{x}) = \beta_0 + \beta_1 X_1 + ... + \beta_k X_k$ is mean from the population and ε is a random component that shows the deviation from mean observations.

GMM method is an extension of the estimation of the moment method. The moment the condition of the population to represent the information that will be used [21]. GMM method takes the concept of the estimation of the moment method, where if at the moment method the number of moment conditions with the number of parameters that are being estimated, while for GMM method the number of moment conditions is greater or equal to the number of parameters that are being estimated [22]. The moment the condition is a function of the model parameters and data that has been determined so that

the value of the hope of the function is zero on the real value of the parameter. The steps the implementation of logistic regression analysis with estimates of the GMM as follows [23].

a. The identification of the data research
b. Perform a descriptive analysis of the response variable and variables predictors of research data
c. Use and modify the algorithm GMM on software R based on the package
d. The interpretation of the parameter coefficient through the value of the odds ratio
e. Calculate the level of accuracy of the prediction of GMM estimation and interpretation.

RESULTS AND DISCUSSION

Variable frequency distribution research, namely breast feeding, birth weight, the number of children under five in the family, status MPASI, education mother, mother economic social status, status of shelter house, passive smoker status, the status of the child immunization and the frequency of genesis acute (RTI) presented in the following table.

Table 1. Research Variable frequency distribution

frequency, % (percent of total)	ACUTE (RTI)			
	Yes		No	
Independent variables	**f**	**%**	**f**	**%**
Pattern of breastfeeding				
Non Breast Milk	111	48.1	19	8.2
Breast milk	10	4.3	91	39.4
Birth weight				
Low birth weight (LBW)	97	42.0	33	14.3
Low birth normal (LBN)	24	10.4	77	33.3
The number of infants				
> 2	64	27.7	63	27.3
< 2	57	24.7	47	20.3
***MPASI* < 6 month**				
Yes	74	32.0	44	19.0
Not	47	20.3	66	28.6
Social Economy				
Less	86	37.2	66	28.6
Enough	35	15.2	44	19.0
Education				
Low	90	39.0	72	31.2
High	31	13.4	38	16.5
Home Shelter				
Crowded	70	30.3	36	15.6
According	51	22.1	74	32.0
Passive smoker				
Yes	85	38.8	33	14.3
No	36	15.6	77	33.3
Immunization				
Incomplete	88	38.1	65	28.1
Complete	33	14.3	45	19.5

Table 1 shows that the feeding patterns of breast milk for children non acute (RTI) (48.1%), low birth weight is ($\leq$ 2500 grams) is 42.0 percent who experienced acute (RTI). The subject of the research that has been getting MPASI $\leq$ 6 month experience genesis acute (RTI) (32.0%). The subjects that have a low social-economic status suffered acute (RTI) (37.28%), children who have a mother with low levels of education experience acute (RTI) (39.03%), children who live with a crowded house shelter is 30.3 percent who experienced acute (RTI). Children with the family of the status of the passive smoker more who suffered acute (RTI) (38.8%), and children with the status of immunization is not complete the more experienced acute (RTI) (38.1%)

The influence of the variables the pattern of breastfeeding, birth weight, the number of infants, giving MPASI, socio-economic status, education mother, status of shelter house, passive smoker status, the status of the child immunization with genesis acute (RTI) done with logistic regression method with MLE and GMM estimation. The results of the estimation of GMM on logistic regression model is processed through the *package R*, with the explanation as follows:

Table 2. Logistic Regression Model Parameter estimation on Genesis Acute (RTI)

Independen Variables	Logistic regression									
	MLE					GMM				
	Estimate	Std. Error	Wald	Sig.	Odds Ratio	Estimate	Std. Error	Wald	Sig.	Odds Ratio
Constanta	-3.826	.771	24.639	0.000	.022	-2.654	0.441	-6.016	0.000	0.070
Pattern of breastfeeding (X1)	4.225	.596	50.217	0.000	68.366	4.140	0.905	4.576	0.000	62.803
Birth weight (X2)	2.932	.595	24.325	0.000	18.774	1.772	0.573	3.091	0.002	5.883
The number of infants (X3)	-1.026	.553	3.441	0.064	.359	-0.508	0.541	-0.940	0.347	0.602
***MPASI* < 6 month (X4)**	1.828	.554	10.878	0.001	6.219	1.249	0.421	2.966	0.003	3.487
Mothers Education (X5)	1,006	.600	2.811	0.094	2.736	0.086	0.531	0.163	0.871	1.090
Social Economy (X6)	1.173	.557	4.437	0.035	3.231	1.137	0.480	-2.369	0.018	3.117
Home Shelter (X7)	-.029	.536	.003	0.957	.972	-1.304	0.895	-1.457	0.145	0.271
Passive smoker (X8)	.748	.540	1.915	0.166	2.112	1.754	0.809	2,169	0.030	5.778
Immunization Status (X9)	.799	.546	2.139	0.144	2.222	0.953	0.482	1.980	0.048	2.593
Goodness of Fit Model	21.055 (0.007)					0.112 (0.000)				

Table 2 shows with MLE method that the variables X3, X5, X7, X8 and X9 is not significant because the value of Sig is greater than α=5 percent while with GMM method variable is not significant is X3, X5 and X7. The Model with the value of Goodness of Fit a small said a good model, GMM method is better than the MLE method. Based on the estimates of the GMM, it can be concluded that the variables affect the genesis acute (RTI) is the variables X1, X2, X4, X6, X8 and X9. The Model is obtained from the results of the GMM estimation is as follows:

$$\hat{\pi}(x) = \frac{e^{(-3.826+4.225x_{1.1}+2.932x_{2.1}-1.026x_{3.1}+1.828x_{4.1}+1.006x_{5.1}+1.173x_{6.1}-0.029x_{7.1}+0.748x_{8.1}-0.799x_{9.1})}}{1+e^{(-3.826+4.225x_{1.1}+2.932x_{2.1}-1.026x_{3.1}+1.828x_{4.1}+1.006x_{5.1}+1.173x_{6.1}-0.029x_{7.1}+0.748x_{8.1}-0.799x_{9.1})}}$$

So the opportunity of each variable to genesis acute (RTI) as follows:

- The pattern of breastfeeding (X1)
  Children who are given breast milk has the opportunity of non 0.984 happened the prevalence of acute (RTI), and children with feeding patterns non breast milk will be affected by acute (RTI) of 62.803 times compared with children with feeding patterns of breast milk. This is in line with the research of [24], stating that the things that can affect the genesis pneumonia in children is the lack of breast milk as the food naturally can optimize the immune system in the body of the son.
- Birth weight (X2)
  The son who was born with a birth weight with body weight < 2500 grams have the possibility of experiencing acute (RTI) of 0.855, and will experience acute (RTI) of 5.883 times higher compared with children who have birth weight normal. This is also in line with the research of [24] stating that the things that can affect the genesis pneumonia in children is LBW. Infants with low birth weight (LBW) shows a tendency to more susceptible to infection than infants with birth weight normal (LBN) and it is the cause of the high level of the death of the baby.
- *MPASI* < 6 months (X4)
  The children with the gift of *MPASI* early (less than 6 months) has the possibility of experiencing acute (RTI) of 0.777, and will experience acute (RTI) of 3.487 times higher compared with children with the gift of MPASI more than 6 months. This is in line with the research [25] states that provide *MPASI* before children aged 2 weeks (+3 months) will lead to the symptoms of acute (RTI) and the excessive fat content founding Catholic Saints children.
- Social Economy (X6)
  Children with socio-economic status less has the possibility of experiencing acute (RTI) of 0.757, and will experience acute (RTI) of 3.117 times higher compared with children with high economic social status. This can be explained that the socio-economic status influence on education and other factors such as nutrition, lingkuingan and acceptance of health services. Parents who come from high economic social level better able to provide a healthy food vitamins and supplements that can help improve the health status of the family. Children who come from families with low socio-economic status have a greater risk of experiencing episodes acute (RTI).
- Passive smoker (X8)
  Children in the family members is that smoking has the possibility of experiencing acute (RTI) of 0.852, and will experience acute (RTI) of 5.778 times higher compared with the children in the family members there is no smoking rooms. This is related to measles, pertussis and some other disease can increase the risk acute (RTI) and weighed acute (RTI) itself, but actually it can be prevented. Measles, Pertussis and Difteri together can cause 15-25 percent of all deaths related to acute (RTI).
- Immunization Status (X9)
  Children with incomplete immunization status has the possibility of experiencing acute (RTI) of 0.722, and will experience acute (RTI) of 2.593 times higher compared with children with complete immunization status. This shows that one of the causes of children experiencing the attack acute (RTI) because the family members are smoking so that children were exposed to smoke that cause an attack acute (RTI).
- The number of children under five (X3), education mother (X5) and shelter house (X7)
  Early childhood number of variables (X3), education mother (X5) and shelter house (X7) does not affect the genesis acute (RTI). This is in line with the result is empowered with [26]. The three researchers reveal that the number of infants who live with children are not significant with genesis acute (RTI). Research results explained that the number of infants who live together and genesis acute (RTI) depends on the origin of the disease, namely tetular or not. According, [26] reveals that education mothers did not affect the acute (RTI), but father education affect the genesis acute (RTI) is possible because my father role holders as wage earner so that determine the social status of the family economy. Research [27] also stated that the education level of the mother is not significant on the incident of acute (RTI). Meanwhile, children who suffered acute (RTI) more occurs on children who live with a crowded house shelter, but based on the results of the analysis found that shelter house voted for shows a significant outcome of Genesis acute (RTI). Building area which is not comparable with the number of companions is not healthy because it can cause a lack of oxygen consumption and carbon dioxide increase in the pool so that facilitate the transmission of infectious diseases, because the density of shelter can affect the quality of the air in the house where the more the number of companions then will the faster the air inside the house of experiencing contamination.

CONCLUSION

The results of the study showed that the estimates of the GMM method on logistic regression model gives better performance in terms of the significance and interpretation than MLE estimation method. The prevalence of acute (RTI) on

children 6-12 months more often occurs in children who are not given breast milk, on children with LBW (< 2500 grams), on children who get MPASI at age ≤ 6 months, on children in families with low economic social status, on children with passive smoker status, on children with the status of immunization is not complete. Children are given breast milk partially suffered acute (RTI) higher compared with breast feeding by exclusion. The number of infants more than 2 in the house of the level of education of mother and shelter house, not related to the Genesis acute (RTI). It is expected that research based on the election pembobot used *Bartlett kernel*, *Parzen kernel*, *Truncated kernel*, and *Tukey-Hanning kernel* that is made possible by the GMM estimation provides better results.

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